

SECTION 14212

HYDRAULIC ELEVATOR

PART 1 GENERAL

1.1 DESCRIPTION

- A. Work of this section includes all labor, materials, equipment and service necessary to complete the elevator or elevators as shown on the drawings and specified herein and/or specified in the master installation and maintenance specifications.
- B. All work will be installed in accordance with the most restrictive requirements of the ASME A17.1 Code (currently 2004 with 2005 supplements) as specified in the 2006 International Building Code, New Jersey Edition. **Specification writer shall see section 1.4 of the Princeton University Design Standards. Since these codes do change periodically, see the University Code Analyst cited in section 1.4 before citing a specific regulatory code.**

1.2 RELATED SECTIONS

NOTE TO SPECIFICATION WRITER: Insure that the items listed below are appropriately addressed in other specification sections.

- A. Protecting hoistway during installation of equipment. Barricades installed by the General Contractor will be maintained by the Elevator Contractor.
- B. Cutting and patching.
- C. Grouting under hoistway doorsills and at jambs.
- D. Concrete shaft and slabs.
- E. Machine room enclosure.
- F. Access ladder.
- G. Pit waterproofing and sump pump installation.
- H. Ventilation and Heating of hoistway and machine room.
- I. Life safety system speakers
- J. [Floor tile] [carpet] **[Delete if elevator contractor is required to install the floor tile or carpet in the elevator cab.]**
- K. Electrical Requirements: **[NOTE to specification writer: Delete any items not required by this project. Those items that will be the responsibility of the elevator**

contractor should be deleted from the listing below and placed in the appropriate location elsewhere in this specification.]

1. Lighting and GFCI 120 VAC convenience outlets in pit, machine room, and overhead machinery space.
2. Dedicated non-GFCI 120 VAC outlet in pit for sump pump and scavenger pump.
3. [Conduit from the closest hoistway of each elevator group or single elevator to the firefighters' control room and/or main control console.] Coordinate size, number, and location of conduits with Elevator Contractor.
4. Three-phase mainline copper power feeder to terminals of each elevator controller in the machine room with protected, lockable "off", disconnect switch. [Provide auxiliary disconnects in multi-level machine room.]
5. Single-phase copper power feeder to each elevator controller for lighting and exhaust blower with individual protected, lockable "off", disconnect switch located in machine room.
6. Emergency public telephone service with dedicated line to each individual elevator control panel in elevator machine room.
7. Products-of-combustion sensors in each elevator lobby, machine room, top of hoistway and elevator pit per NFPA No. 72, Chapter 5-3 to initiate firemen's service return feature. Provide sensor signal wiring from hoistway or machine room connection point to elevator controller terminals.
8. Temporary power and illumination to install, test and adjust elevator equipment.
9. [Means to manually and automatically disconnect power to affected elevator drive unit and controller prior to activation of machine room overhead fire sprinkler system, and/or hoistway overhead fire sprinkler system.] Manual shut-off means shall be located outside bounds of machine room.
10. [When sprinklers are provided in the hoistway all electrical equipment, except seismic protective devices, located less than 4'-0" above the pit floor shall be identified for use in wet locations (ANSI/NFPA70).
11. Power feeders to main control console and firefighters' monitor.
12. [Power feeder to each elevator controller in machine room for elevator car heating and air conditioning unit, if provided.]
13. [Single-phase power feeders to machine room elevator group control monitor with single-phase, protected, lockable "off", disconnect switch.]
- 14. Provide data port to which the Motion 2000 controller will be connected. (The controller can be monitored remotely via the web.)**

1.3 QUALITY ASSURANCE

A. The approved elevator installation companies are:

- | | |
|----------------------------------|-----------------------------|
| 1. ThyssenKrupp Elevator Company | 4. Amtech Elevator Services |
| 2. Quality Elevator Company | 5. Code Elevator Company |

3 North American/Hutcherson Elevator

B. The approved elevator component manufactures are:

1. Hydraulic Components – CEMCO, Canton, or ThyssenKrupp. EECO units are not acceptable.
2. Tracks, Hangers and Interlocks – G.A.L.
3. Door Operators: G.A.L. MOVFR
4. Fixtures (including Car Top Inspection Station) – Adams (EPCO) Survivor Plus vandalism resistant fixtures
5. Door Protection:
 - a. Adams Gatekeeper 2000
 - b. Pana 40 Plus by Janus Products
6. Guide Assemblies: ELSCO
7. Entrances and Car Enclosures:
 - c. Brice Southern
 - d. Dover
 - e. EDI/ECI
 - f. KONE
 - g. Otis
 - h. Schindler
 - g. Gunderlin
 - h. National
 - i. H & B

The approved controller is:

1. Motion Control Engineering (MCE) Motion 2000 Hydraulic Control

1.4 REGULATORY AGENCIES

A. Conform to:

1. ANSI A17.1
2. NFPA Codes
3. OSHA

4. American with Disabilities Act

5. National Electrical Code

1.5 REFERENCE STANDARDS

- A. AISC – Specification for the Design, Fabrication and Erection of Structural Steel for Buildings
- B. ANSI A117.1 – Building and Facilities – Providing Accessibility and Usability for Physically Handicapped People
- C. ANSI/ASME A17.2 – Inspector’s Manual for Elevators and Escalators
- D. ANSI/AWS D1.1 – Structural Welding Code, Steel
- E. ANSI/IEEE – 519-1992
- F. ANSI/IEEE – Guide for Surge Withstand Capability (SWC) Tests
- G. ANSI/NFPA 70 – National Electrical Code
- H. ANSI/NFPA 80 – Fire Doors and Windows
- I. ANSI/UL 10B – Fire Tests of Door Assemblies
- J. APA – American Plywood Association
- K. ASTM A36 – Structural Steel
- L. ASTM A53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- M. ASTM A139 – Electric-Fusion (ARC) Welded Steel Pipe (NPS 4 Inch and Over)
- N. ASTM A167 – Stainless and Heat-Resisting Chromium Nickel Steel Plate, Sheet and Strip
- O. ASTM A366 – Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality
- P. ASTM A446 – Steel Sheet, Zinc Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
- Q. ASTM B221 – Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
- R. International Building Code, New Jersey 2006 Edition
- S. N.J.A.C. 7:9D Well Construction and Maintenance

1.6 SUBMITTALS

A. Comply with the requirements of Section 01300.

B. Submit the following:

1. Samples

Item No.	Quantity	Size	Description
S1	3	12" x 12"	Glass
S2	3	12" x 12"	Baked Enamel
S3	3	12" x 12"	Stainless Steel
S4	3	12" x 12"	Brushed or Antique Bronze
S5	1 set	12" x 12"	Plastic Laminate Cab Wall Panel Samples
S6	1	Actual	Button Sample
S7	1	Actual	Braille Plate

2. Shop Drawings

- a. Machine room plan indicating:
 - 1). Location of Equipment
 - 2). Service Connections
 - 3). Power unit weights
- b. Fully dimensioned hoistway/wellway plan and section indicating the following features at a minimum scale of 1" = 1'-0":
 - 1). Platform (with cab), hoistway and entrance dimensions
 - 2). All running clearances
 - 3). Location of fixtures
 - 4). Buffers, service ladders and pit reactions
 - 5). Location of inserts
 - 6). Rail reactions
- c. Entrance details at a scale of 3" = 1'-0"
- d. Sill support angle details at a scale of 3" = 1'-0"
- e. Fixture details at a scale of 3" = 1'-0"
- f. Wiring diagrams
- g. All face plates/operating panels will all engraving at a scale of 6"=1'-0" minimum

3. Calculations

- a. Rail loads
 - b. Pit reactions
 - c. Heat emissions in machine room
 - d. Electrical loads including starting, accelerating and running currents. Include all auxiliary loads.
 - e. Jack loads
4. Submit catalog cuts of controller car enclosure and other elevator equipment for approval.

1.7 PERMITS, TESTING AND INSPECTIONS

- A. File necessary drawings for approval of all authorities having jurisdiction, obtain and pay all required fees for permits, tests and inspections, etc., which may be required for the execution of this work. Copies of all permits shall be forwarded to the Project Manager.
- B. Furnish all test instruments and materials required at the time of final inspection. The inspection outlines in the American Standard Practice for the inspection of Elevators, Inspector's Manual A17.2 (latest edition) will be followed.
- C. After hour tests of systems such as emergency generators or fire service shall be conducted at no extra cost to the Owner.

1.8 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

- A. Delivery, Storage and Handling
 - 1. Deliver materials to the site ready for use in the accepted manufacturer's original and unopened containers and packaging, bearing labels as to type of material, brand name and manufacturer's name. Delivered materials shall be identical to accepted samples.
 - 2. Store materials under cover in a dry and clean location, off the ground. Remove delivered materials, which are damaged or otherwise not suitable for installation from the job site and replace with acceptable materials. Coordinate with Owner as required.

1.9 CONTRACT CLOSE-OUT

- A. Guarantee and Warranties
 - 1. Warrant the equipment installed under these specifications against defects in material and workmanship and correct any defects not due to ordinary wear and tear or improper use or car, which may develop within a period of one (1) year from the date of final acceptance of the construction project.
 - 2. This warrantee shall be written and issued at the completion of each unit prior to final payment.

1.10 OPERATING AND MAINTENANCE DATA

- A. Provide three (3) sets of the following documents prior to or on the date of final acceptance of the elevators:
 - 1. Furnish neatly bound instructions giving the method of control and operation, together with data on all switches, relays and other devices as will be needed for servicing and for ordering replacements.
 - 2. Furnish bound instructions and recommendations for maintenance, with special reference to lubrication and lubricants.
 - 3. Furnish sets of complete and legible “as-built” field wiring diagrams, layouts and straight line diagrams showing the electrical connections, functions, and sequence of operation of all apparatus connected with the system both in the machine room and in the hoistway, together with photographs or cuts of controller repair parts with part numbers listed.
- B. Furnish one complete set of all diagnostic tools, equipment and documentation required for the complete maintenance of all aspects of the control and dispatch system. The diagnostic system shall be an integral part of the controller and shall provide user-friendly interaction between the serviceman and the controls.
- C. Documentation shall include a description of component function and a hard copy schematic of the microprocessor programming. All such systems shall be free from secret codes and decaying circuits that must be periodically reprogrammed by the manufacturer.
- D. Maintenance Improvement Process: Establish a monitoring procedure to provide the highest degree of safety to the riding public and to avoid contaminating soil and ground water supplies. The following procedures shall be implemented when required:
 - 1. Fluid Loss Reporting: Used for documenting the oil level during routine maintenance examinations. A form shall be maintained in each elevator machine room and placed on-file with Princeton University Department of Grounds and Building Maintenance. The report shall identify any added oil and why the oil was added. Complete reports shall be on file with the Maintenance Provider and placed on-file with Princeton University Department of grounds and Building Maintenance. Any unexplained oil loss shall be reported immediately, followed by a no-load test, as detailed in ANSI A17.1, 1005.2b followed by a first notice to the owner.
 - 2. If an unexplained oil loss is found in paragraph 1 above, a full load test must be performed at once. Refer to ANSI A17.1, Rule 1005.2a. The relief valve must be tested to determine that it will pass the full out-put of the pump before the pressure exceeds 105% of the pump out-put. Following standard safety procedures, ease the car up at leveling speed on the piston stop ring. (Check to verify that the installation meets applicable codes in connection with overhead clearances before proceeding.) Continue to apply hydraulic pressure until the relief valve opens. Check that the pressure is no greater than 150% of full load and not less than 125% of full load.

Close the gate valve in the motor room and observe that the pressure does not drop. If the pressure drop is 50 pounds or more over a 2 minute period, then a second notice to the owner should be issued and the equipment shut down.

3. Final test Procedure: The test procedure set forth in A17.1 is required if any doubt exists after performing the procedure in paragraph 2 above.

1.11 WARRANTY MAINTENANCE

- A. Furnish full protective warranty maintenance on the equipment described herein, for a period of one (1) year from the date of final acceptance of the construction project. The maintenance shall include systematic monthly examinations, adjustments and lubrication of all equipment. Also repair or replace any parts or equipment whenever this is required during the maintenance period. Use only genuine standard parts produced by the manufacturer of the equipment installed.
- B. All work under the maintenance provisions shall be performed by competent personnel under the supervision and in the direct employ of the Contractor. Twenty-four (24) hour emergency call back service shall be provided when needed at all times as part of the contract.
- C. Provide interim maintenance on all units completed and put in service prior to the overall project completion.
- D. The Owner reserves the right to make inspections and tests as and when deemed advisable. If it is found that the elevator and associated equipment are deficient either electrically or mechanically, the Contractor will be notified of these deficiencies in writing, and it shall be his responsibility to make corrections within 30 days after his receipt of such notice. In the event that the deficiencies have not been corrected within 30 days, the Owner may terminate the contract and employ a Contractor to make the corrections at the original bidder's expense.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Rolled Steel Sections, Shapes, Rods: ANSI/ASTM A36
- B. Jack Casing: ASTM A139 Grade A steel
- C. Sheet Steel: ANSI/ASTM A366 Class with matte finish
- D. Aluminum: ASTM B221 extruded
- E. Stainless steel sheet: No. 4 finish
- F. Brushed Bronze Sheet: No.4 finish (**Add “treated to selected antique bronze appearance” if desired by the designer**)

2.2 FINISH MATERIALS

- A. Shop and Touch-Up Primer: SSPC 15, Type 1, red oxide
- B. Finish Paint (for Metal Surfaces): Baked alkyd enamel, custom colors and glass as selected from NAAMM metal finish manual by the Architect.

2.3 GENERAL DESCRIPTION

NOTE TO SPECIFICATION WRITER: Several of the entries below require your input based on individual job conditions. You must insert data below wherever you see the word “Specify”.

- A. Elevator No. _____ (Specify Elevator No.)
 - 1. Quantity – **Specify the quantity of elevators.**
 - 2. Type – **Specify one of the following:**
 - a. Passenger standard in-ground hydraulic.
 - b. Service standard in-ground hydraulic.
 - c. Freight standard in-ground hydraulic with C3 Loading.
 - 3. Capacity (lbs.) – **Specify capacity** (Minimum of 2500 pounds)
 - 4. Speed (fpm) – **Specify** (100 for freight elevators and 125 or 150 Passenger elevators)
 - 5. Travel in Feet – **Specify**
 - 6. Number of Landings – **Specify**
 - 7. Front Openings – **Specify**
 - 8. Rear Openings – **Specify**
 - 9. Home Landing – **Specify** (Main Entry Level)
 - 10. Machine Type - Pump Unit
 - 11. Machine Location – Preferred Location: Adjacent. Only locate remote if no other choice is available.
 - 12. Operation – **Specify one of the following:**
 - a. Two- Stop Collective (Use for one elevator with a maximum of two floors).
 - b. Simplex Selective Collective (Use for one elevator with three or more floors).

- b. Duplex Selective Collective (Use for two elevators side-by-side serving three or more floors).
- 13. Control – AC for Hydraulic
- 14. Control Features
 - Independent Operation
 - Fire Recall Service
 - Variable Door Times
 - Anti-Nuisance Feature
 - Automatic Car Light/Fan Feature
 - Emergency Power Operation
- 15. Fireman's Control – Phase I and Phase II
- 16. Number of Push Button Risers – One (1)
- 17. Platform Size – 7'-0" wide x 5'-0" deep is the minimum acceptable.
- 18. Cab Height – 8'-0" clear floor to ceiling.
- 19. Guide Rails – Steel tees at sides – Provide rail backing as required.
- 20. Guide Shoes – Roller (Slide Guide shoes can be specified for Freight Elevators)
- 21. Buffers – Spring
- 22. Car Door Size – 3'-0" wide x 7'-0" high [minimum acceptable]
- 23. Hoistway Door Size – Same as Car
- 24. Door Operation –
 - Specify one of the following:**
 - Single Speed Center Opening
 - Single Speed Side Opening
 - Two Speed Center or Side Opening
- 25. Door Protective Device – Infrared Light Curtain Type
- 26. Entrances –
 - Specify one of the following Finishes:**
 - a. Baked Enamel
 - b. Stainless Steel with no. 4 Finish
 - c. Brushed Bronze with no. 4 Finish
 - d. Antique Bronze with no. 4 finish

Entrances are to be Unit Frame Construction with welded and invisible joints, ground smooth, 2” wide square profile.

27. Sills

a. Car – Extruded Aluminum [Use Cast Iron for freight Elevators above 8,000 pounds] [Extruded bronze antiqued to match fixtures when bronze is cited in lieu of stainless steel]

b. All Landings – Extruded Aluminum [Use Cast Iron for freight Elevators above 8,000 pounds] [Extruded bronze antiqued to match fixtures when bronze is cited in lieu of stainless steel]

28. Emergency Light Fixture – In-Car Operating Panel without separate faceplate, flush mounted with a minimum of two (2) incandescent lamps.

29. Car Fan – Two-Speed to Provide at Least 1.0 Air Change a minute at low speed and 1.5 air changes a minute at high speed.

30. Car Enclosure See Paragraph 2.11

31. Fixtures

a. Main Car Operating Panel – All panels shall be applied hinge type.
Specify one of the following finishes:

- (1). Stainless steel no. 4 finish
- (2). Brushed Bronze no. 4 finish
- (3). Antique Bronze

1). Emergency Stop – Keyed Switch

2). Communication – Push-to-Call Instrument; Model SSP 571D-ADA-AA-93 as manufactured by Communication & Engineering Company (CEEEO).

3). Inspection Certificate – On File – Not Posted

b. Aux. Car Operating Panel – Use only on large cars with two doors.

- c. Corridor Push Button Station – 1/8” Faceplate Cover with Tamperproof Screws. **Specify desired finish.**
- d. Car and Hall Call Buttons – Target Type as manufactured by Adams (EPCO) Model Survivor/Plus. **Specify button finish.** [Car position indicator shall be included in hall fixtures when more than three floors are served.]
- e. Lanterns with Gong – **Specify either Hall or Car Lanterns.** Lanterns shall be Adams Survivor Plus lanterns with a 1/8 inch thick faceplate Faceplates to be secured with tamperproof screws. **Specify finish.**
- f. Car Position Indicator – 2” High Liquid Crystal or LED Indicators with direction arrows, integral with car operating panel.

32. Structural Loads: This information shall be shown on the manufacturer’s shop drawings:

- a. Cylinder Impact Load - _____Pounds Per Cylinder
- b. Buffer Impact Load - _____Pounds Per Buffer
- c. Rail Loads: (Zone 2)
 - 1). R1 - _____Pounds
 - 2). R2 - _____Pounds

33. Electrical and Mechanical Loads:

- a. Motor Horsepower - _____HP
- b. Power Supply - 460 volts, 3 phase, 60 Hertz
 - c. (Use 208 volts only if 460 volts is not available)
- d. Starting Current - _____Amps
- e. Running Current - _____Amps
- f. Heat Released - _____BTU/HR/Unit

2.4 FIXED HOISTWAY EQUIPMENT

A. Guide Rails, Inserts and Brackets

1. Provide standard T section guide rails with tongue and grooved joints for the Car. Use not less than 15-pound rails.
2. Use not less than 3/4" thick steel machined fishplates to form rail joints. Connect rails to fishplate with four (4) bolts.
3. Brackets shall be used to support the rails from the hoistway framing and/or inserts. The rails shall be attached to the brackets by heavy clamps or clips. Bolting or welding rails to brackets shall only be allowed in certain instances.
4. Provide rail backing where the vertical distance between support framing is greater than 14'-0" and less than 16'-0", (is it required if less than 14' and greater than 16'??? PAD) and no intermediate support frame is shown on the drawing. Provide intermediate counterweight tie brackets where necessary to meet Code requirements. **[NOTE TO SPECIFIER: IF CAPACITY IS GREATER THAN 4500 Pounds, VERTICAL SUPPORT SPACING REQUIREMENTS FOR RAILS DECLINE SIGNIFICANTLY – REVIEW A17.1 CODE REQUIREMENTS]**
5. All guide rails shall be erected plumb and parallel to a maximum deviation of 1/8 inch (plus or minus 1/16 inch).

B. Buffers

1. Provide spring type buffers. The buffers shall comply in all respects with the requirements of the ASME Code. The buffers shall be designed to withstand free-falling loaded car.
2. The buffers shall have been tested by a qualified testing laboratory and approved as complying with the ASME Code. The buffers marking plate shall be permanent and legible indicating the manufacturer's name, identification number and stroke.

C. Normal and Final Terminal Stopping Devices

1. Provide normal terminal stopping devices to stop the car automatically from any speed obtained under normal operation within the top and bottom overtravels independent of the operating devices emergency terminal speed limiting device and the buffers.
2. Provide emergency terminal speed limiting devices to ensure that the plunger does not strike its stop ring at more than 100 fpm.
3. The terminal stopping and limiting devices shall have rollers with rubber or other approved composition tread to provide silent operation when actuated by the fixed cam in the hoistway.

D. Interlocks, Contacts and Unlocking Devices

1. Equip each elevator hoistway door with a positive interlock, which shall prevent the operation of the elevator unless all elevator doors are closed and maintained closed when elevator is away from the landing. The interlocks shall also prevent the opening of a hoistway door from the landing side, unless the car is within the landing zone and is either stopped or being stopped at that level. Retiring cams used to actuate interlock shall be securely fastened to car construction and shall be designed to operate without objectionable noise, shock or jar. Design interlocks so that they are not easily accessible from the landing side.
2. Provide electric contacts on top of emergency exit panel to prevent the operation of the elevator when the contacts are not open.

E. Hoistway/Car Door Hangers, Sheaves and Tracks

1. Provide a sheave type two-point suspension hanger and track for each hoistway and car door. Sheaves shall be hardened steel, not less than 3-1/4 inches in diameter with sealed grease packed precision ball bearing.
2. The upthrust shall be taken by a roller mounted on the hanger and arranged to ride on the underside of the track.
3. The track shall be of formed cold rolled steel or cold drawn steel and shall be rounded on the track surface to receive the hanger sheaves. The track shall be removable and shall not be integral with the header.

F. Stop Switches

1. Provide a readily accessible switch for stopping and maintaining the elevator out of service in the pit, on top of the car and in the car-operating panel.

G. Hoistway Entrance Structure

NOTE TO SPECIFICATION WRITER: The finish of both frames and doors must be noted in this section (Steel with baked enamel finish, stainless steel with no. 4 finish or bronze with no. 4 finish treated to selected antique finish.)

1. Frames – 14-gauge steel, welded construction, ground smooth one piece with invisible joints, 2" wide square profile. Provide all mounting cutouts as required for frame mount signage and signal devices. Provide mechanically attached Arabic floor designation plates, centerline 60" above finished floor on both side jambs. Provide main egress landing plates with "Star" designation.
2. Doors – The doors shall be constructed of 16 gauge steel not less than 1-1/4" thick, reinforced to accept hangers, interlocks and door closures. Equip all hoistway landing doors with one-piece full height non-vision wings of material and finish to match hall side of door panels.

- a. Provide each door panel with two removable laminated plastic composition guides and one steel fire stop guide between them. Arrange the guides to run in sill grooves with a minimum clearance. The guide mounting shall permit their replacement without removing the door from the hangers.
3. Entrances shall bear 1-1/2 hour label of Underwriter's Laboratories, Inc.
4. Sills – Provide [extruded aluminum] [cast iron (for freight elevators 8,000 pounds or larger)]sills with the nosing approximately one (1) inch deep and running the full length of door travel. The wearing surface shall be a minimum of 1/4" thick and be of a non-slip type with the door guide grooves providing a minimum clearance for the guides. Rigidly secure the sills to sill support angles by means of steel sill support brackets or blocking with necessary metal shimming or adjustments.
5. Struts – Struts shall be hot rolled steel angles not lighter than 3 inches by 3 inches by 1/4 inch. Extend the struts from top of sill to either the bottom of floor beam or intermediate framing above. Bolt struts in place with not less than two (2) bolts at each end. Strut clip angles or brackets shall have a thickness not less than the thickness of the supported strut.
6. Track Support – 3/16 inch thick steel track support plate shall extend between and be bolted to the vertical steel struts with no less than two (2) bolts at each end.
7. Track Covers – 16 gauge steel coverplates shall extend the full travel of the doors. Covers shall be made in sections for service access to hangers, sheaves, tracks and interlocks. The sections above the door opening shall be movable from within the elevator car. Cover fastening devices shall be non-removable from the cover.
8. Fascias – 16 gauge steel fascia plates shall extend at least the full width of the door and be secured at hanger support and sill with oval head machine screws.
9. Provide fascia plates where the clearance between the edge of the loading side of the platform and the inside face of the hoistway enclosure exceeds the code allowed clearance.
10. Dust Covers – Provide 16 gauge dust covers to extend 6 inches above any header not protected by fascia. The dust covers shall extend to a full width of travel of the doors, return at a 15-degree angle and be firmly fastened.
11. Bumpers – [Provide the leading edge of center opening door panels with continuous black rubber astragal bumper strips. The strips shall be relatively inconspicuous when the doors are closed and shall be easily replaced.] [For side opening doors provide rubber bumper pads at the top and bottom of the entrance jambs to receive the leading edge of the doors.] Provide rubber bumpers at the top and bottom of the door to stop them at their limit of travel in the opening direction.

H. Hoistway Access

1. Provide hoistway door unlocking devices and holes at each entrance. The keyhole of the device shall be fitted with a metal ferrule that matches the door finish.
2. Hoistway Access Switches: Mount in entrance frame side jamb at the top and bottom floors. Provide switch without faceplate.

I. Well Installation for Hydraulic Elevator:

1. All work installing the well shall be in accordance with N.J.A.C. 7:9D. A valid New Jersey well permit is required. The work must be overseen by a Master Well Driller, or a journeyman well driller, or a journeyman Class B well driller any of which must be licensed by the state of New Jersey. When the well has been completed a well record must be provided to the New Jersey Department of Environmental Protection on their appropriate forms to include an as-built location of the well.
2. Since nearly all wells at Princeton University strike a rock layer at a relatively shallow depth, all wells shall be drilled a minimum of 4 inches in diameter larger than required. The wells shall be drilled with a rotary drill in accordance with N.J.A.C. 7:9D-2.1(a)4, 7:9D-2.2, and 7:9D-2.5(d). No hammer drilling or blasting shall be allowed. No additional compensation will be allowed for unforeseen conditions of any kind or spoil removal. A temporary well casing of the diameter of the drill may be driven in at the top of the well to maintain the hole until rock is struck.
3. When the well has been drilled, a steel well casing conforming to ASTM A-53 shall be inserted into the well hole. The steel well casing shall be not less than 18 inches in diameter with a wall thickness of 0.375 inches and shall have a water tight welded steel bottom of the same wall thickness and steel type. The casing shall be accurately set, positioned, and plumbed to accept the jack unit and PVC liner to be installed by the elevator contractor. The well casing shall be installed with its top a minimum of 6 inches above the finish pit floor height and shall be capped to prevent debris from falling into the well casing prior to installation of the jack unit and PVC liner. The well casing shall be inspected, before installation.
4. When the well casing has been installed and set, the annular space surrounding the casing shall be filled utilizing a tremie pipe with a grout material specified in N.J.A.C. 7:9D-2.9 following the procedures in N.J.A.C. 7:9D-2.10. When the grout placement and any additional placement after settlement has been installed to the top of the well hole, the well driller shall furnish a steel collar with a 2 foot by 2 foot flange to be welded to the liner and embedded in the pits concrete floor when the floor is poured.
5. When the well casing's installation has been completed and prior to capping, any water in the well casing shall be pumped out to leave the interior of the liner empty.
6. Remove spoils, dirt and debris from the well installation

J. Jack Units

1. Design and construct the jack unit in accordance with the applicable requirements of the ASME Code. It shall be of sufficient size to lift the gross load at the rated speed to the height specified and shall be factory tested to ensure adequate strength and freedom from leakage. No brittle material, such as grey cast iron, shall be used in the jack construction.
2. The jack units shall consist of:
 - a. A plunger of heavy seamless steel tubing turned smooth and true to $\pm .15$ inches tolerance, and with no diameter change greater than .04 inches per foot of length.
 - b. A stop ring electrically welded to the plunger to prevent plunger leaving its cylinder.
 - c. Internal guide bearing which is to be bronze or phenolic-lined type.
 - a. Cylinder head with a self-adjusting type and removable packing gland to facilitate replacement of packing.
 - b. A drip ring below cylinder head to collect oil.
 - c. A bleeder valve to release gasses from the system.
3. Before inserting the jack assembly into sleeve, double spiral wrap cylinder wall with self-adhesive black polyethylene chloride tape of minimum 20 mil thickness. Application, width and overlap of tape shall be as recommended by manufacturer of tape used. Cover weld beads with one wrap of tape prior to spiral wrapping.

K. Installation of the Jack Unit and PVC Liner:

1. Install into the empty steel casing a Schedule 40 PVC liner of sufficient size to accommodate the jack assembly. Insure that all PVC joints and the bottom of the PVC liner are well sealed with glue and are liquid tight. Cap the PVC Sleeve until ready to be used.
2. Install the jack unit into the PVC liner insuring that it is plumb and that all joints are welded by a certified welder and that all welded joints are inspected.
3. After the jack unit has been installed carefully fill the void between the PVC liner and the steel casing with 5 to 8 feet of dry sand to permanently affix the bottom of the PVC liner. Seal the space between the steel liner and the PVC liner at the pit floor with a minimum of 6 inches of hydraulic cement.
4. The space between the Jack unit and the PVC liner shall remain empty. If the jack Unit is not a sealed unit, the void between the PVC liner and the Jack unit shall be sealed at the pit floor level with 6 inches of hydraulic cement.

L. Scavenger Pump

1. Provide a positive displacement, rotary type pump for the hydraulic elevators. The pump shall have a discharge pressure of 200 psi maximum and a capacity of 10 gallons per hour.
2. The pump shall be self-priming and self-lubricating. The pump shall be equipped with a 100-mesh screen strainer.
3. The pump housing shall be constructed of brass with stainless steel internal parts.
4. Mount oil return pump off the pit floor and connect it to the jack unit and the oil tank with copper tubing.
5. Pump to be connected to a dedicated receptacle; to be checked and verified by contractor.

2.5 MOVING HOISTWAY EQUIPMENT

A. Top of Car Station

1. Locate an inspection station on top of car that is mobile for ease. This device shall be activated by a switch located in car operating panel and shall include:
 - a. Up and down direction buttons
 - b. A stop switch
 - c. A 110 volt GFCI duplex receptacle
 - d. A work light with wire guard and an “off”-“on” switch
2. When the station is operational, all operating devices in the cab shall be inoperative.

B. Guide Assemblies

1. For passenger and service elevators provide ELSCO Model B roller guide shoes with adjustable mounting base, rigidly bolted to the top and bottom of each side of car frame.
 - a. The Roller guides shall utilize a minimum 6” diameter roller consisting of a set of polyurethane surfaced wheels, held in contact with the three finished rail surfaces by adjustable stabilizing springs. The bearings shall be provided with grease fittings for lubrication; however, the rails are to be installed and shall remain dry. Equip roller guides with adjustable stops to control post-wise float. Fit the top car roller guides with galvanized, 16 gauge steel guards.
2. For freight elevators, ELSCO slide guides may be proposed. Slide guides shall be self lubricating with replaceable inserts or may be dry type slide guides with Teflon inserts.

C. Car Equipment

1. The car frame shall be made of steel members, with a factor of safety as required by the ASME Code. In the event top emergency exit refuge space is restricted due to existing overhead constraints, modify cross head arrangement to suit. There will be no modification to building structure.
2. The car platform shall consist of a steel frame with necessary steel stringers, all securely welded together. The frame and platform shall be so braced and reinforced that no strain will be transmitted to the elevator car.
 - a. Provide platform with two (2) layers of 3/4" marine plywood. Cover the underside of the car platform with sheet steel. [On Freight elevators with aluminum checker plate floor surfaces, the two layers of plywood may be replaced with a steel plate sized to carry the weight].
 - b. Platform shall be provided with vibration isolation pads. The support frame shall carry rubber pads on which the platforms shall rest without any connection to the steel frame.
 - c. Recess platform as directed by the Architect to receive finished flooring.
 - d. Provide sills having a non-slip surface, guide grooves and made of [extruded aluminum] [cast iron (freight elevators 8,000 pounds or more)].
3. Toe Guards – Provide 14 gauge steel toe guards to extend 24 inches below any sill not protected by fascia. The toe guards shall extend the full width of the door and shall return at a 15-degree angle and be firmly fastened.
4. Doors: Provide as described in paragraph 2.11. Provide two phenolic gibs per door panel.

D. Door Operation

1. Mount a high-speed (2-1/2 feet per second) operator on top of car on each opening side to operate the car and hoistway door simultaneously. See paragraph 1.3B3 for acceptable operator models.
2. The door shall operate smoothly without a slam during both opening and closing cycles. Door velocity shall be adjustable and continuously monitored to maintain minimum floor-to-floor performances and door operation times.
3. Use a mechanical closers to automatically close the hoistway door if the car, for any reason, leaves the standing zone.
4. The car and hoistway doors shall open as the car stops at the landing and close before the car can leave the floor.

5. Door Contact – Equip the car door with an electric contact, which will prevent operation of the car unless the car door is in the closed position. The door contacts shall not be readily accessible from the inside of the car.
6. Nudging – If the doors are held open for a predetermined time (30 to 45 seconds; individually adjustable) by interrupting the light rays/detector field, or by holding the door, or by pressing the door open button, a buzzer will sound and the doors shall start to close with reduced kinetic energy in conformance with A17.1 code.
[Inactivate the nudging feature on all freight elevators.]
7. Door Protective Devices:
 - a. Provide an infrared curtain door protection system on all cars.
 - b. The doors shall be prevented from closing from an open position if a person interrupts any one of the light rays. When the doors are closing, any interruption of the protective light field shall cause both the car and corridor doors to reverse. The doors shall start to close when the protection system is free of any obstruction.
 - c. The infrared curtain protective system shall have:
 - 1). Height of the protective field shall match the full door height.
 - 2). Where a horizontal infrared light beam system is used:
 - (a) A minimum of 40 light beams
 - (b) Accurately positioned infrared lights to conform to the requirements of the applicable handicapped code.
 - 3). Modular design to permit on-board test operation and replacement of all circuit boards without removing the complete unit.
 - 4). Controls to shut down the elevator when the unit fails to operate properly.

E. Work Lights and Receptacles

1. Provide fluorescent work lights and GFCI receptacles at top and bottom of elevator car. Provide fluorescent lights with wire guards and local switch.
2. Provide duplex GFCI electrical receptacle in car. Locate inside car operating panel service cabinet. Provide matching faceplate on receptacle.

2.6 CONTROL EQUIPMENT AND FEATURES

A. Wiring

1. Provide all wiring and conduit required for the operation of the elevators.
2. Wiring, conduit and all fittings shall be in accordance with requirements of the National Electric Code and Division 16.

3. Run all wiring in galvanized conduit or in metal wireways. EMT and flexible conduit shall be connected on either end by use of steel set screw fittings. Note: No die cast fittings will be allowed.
4. Flexible metal conduit with ground wiring may be used for short runs from main hoistway wireway to interlocks, fixtures, limit switches and between control panels, motors and brakes.
5. Provide traveling cables with polyvinyl chloride and flame resistant outer cover.
6. Provide 10%, but not less than two (2), spare conductors in each travel cable.
7. All communication cables shall be the shielded type.

B. Option 1: Two-Stop Collective Operation (Use for one elevator with a maximum of two floors).

1. Provide two-stop collective operation from single button hall stations.
2. Hall or car button shall send the car to that floor. Doors open automatically when car arrives. When car is traveling away from a registered hall call, call shall remain registered and car responds on next trip.

Option 2: Simplex Selective Collective Operation (Use for one elevator with three or more floors).

1. Provide simplex selective collective operation from a riser of hall push button stations.
2. The registration of one or more call calls shall dispatch the car to the designated floors in the order in which the floors are reached by the car, irrespective of the sequence in which the calls were registered. The car shall also respond to registered hall calls in the same direction of travel. Car and hall calls shall be canceled when answered.
3. When traveling in the up direction, the car shall stop at floors for which car calls or up hall calls have been registered. It shall not stop at floors where a down hall call only has been registered, unless the stop for that floor is in response to a registered car call, or unless the down hall call is at the highest floor for which any call has been registered. Likewise, a down traveling car shall not stop at a floor where only an up hall call has been registered unless the stop for that floor is in response to a registered car call, or unless the up call is at the lowest floor for which any call has been registered.
4. When the car has responded to the highest or lowest call, and calls are registered for the opposite direction, the car shall reverse direction automatically and respond to those registered calls.

5. If the car has no car calls registered and arrives at a floor where both up and down hall calls have been registered, the car shall respond to the hall call corresponding to the direction of car travel. If, after making its stop, a car call is not registered and no other hall calls exist ahead of the car corresponding to its original direction of travel, the doors shall close and immediately reopen in response to the hall call for the opposite direction.
6. The car shall maintain its original direction at each stop until the doors are fully closed to permit a passenger to register a car call before the car reverses its direction of travel.

Option 3: Duplex Selective Collective (Use for two elevators located side-by-side serving three or more floors)

1. Provide duplex selective collective operation with the two (2) cars arranged to operate from a single riser of hall push buttons.
2. When there is no demand for elevator service, park one car at the Lobby Floor and the other shall be a “free car”, parking at the floor last served. Park both cars with doors closed. The “free car” shall normally respond to any registered hall call except:
 - a. A hall call registered at the Lobby Floor shall be answered by the car parked at the Lobby Floor.
 - b. A hall call registered below the Lobby Floor shall be answered by the car parked at the Lobby Floor.
3. When the car parked at the Lobby Floor responds to a registered car call for a floor above the Lobby Floor, the idle “free car” shall be dispatched automatically to the Lobby Floor, and shall become the assigned Lobby Floor parking car.
4. When the “free car” is responding to registered calls, the Lobby Floor parking car shall automatically start the “free car” under any of the following conditions:
 - a. Registration of hall calls below the “free car” while it is traveling in the up direction.
 - b. Registration of hall calls above the “free car” while it is traveling in the down direction.
 - c. Inability of the “free car” to move in response to a registered hall call within a predetermined time period.
5. When both cars are responding to registered car and hall calls, the first car to complete its calls shall become the assigned Lobby Floor parking car and shall be dispatched automatically to the Lobby Floor.

6. If either car is removed from service, the other car shall respond to all registered hall calls and its own car calls.

C. Independent Service

1. Arrange elevator controls to permit each car to be removed from normal service and to operate in response to car calls only. The door shall not close until car button for another landing is pressed. Activation of this service shall be from a key switch in the car station service panel.

D. Controller and Selector

1. The controller shall be a Motion Control Engineering (MCE) Motion 2000 controller mounted in a NEMA Type 1 enclosure. The controller shall be designed to control the starting acceleration, deceleration and stopping of the elevator and to prevent damage to the motor from overload or excessive current. A relay shall be provided, as required, designed to prevent the operation of the elevator in case of phase reversal, phase failure or low voltage in the power supply. Provide the following options with the controller from MCE: Provide in the controller an Ethernet port. Provide MCE iReport for current and historical performance, activity reporting and archival. Provide iMonitor for remote monitoring and control. Provide a hand held interface with a plug in point in the controller to access all system parameters.
2. Provide a packaged temperature and humidity control unit specifically designed to conditioning air to equipment control panels. The unit shall be capable of keeping the control panel within the manufacturers temperature and humidity requirements a all times including evaporation condensation unit. **Note to specification Writer: Delete if the machine room is air conditioned. The packaged temperature control unit can also be eliminated if the elevator will have low usage and the temperature and humidity expected in the elevator machine room at all times of the year is not excessive.**
3. Provide the LS-QUTE- solid tape and magnets MCE landing system, which shall perform all functions incidental to the control system, which relates to the position and movement of the car in the hoistway.
4. All controller wiring shall be neatly formed and tied. The wiring on the back of the panel shall be of the flame-resistant type. The terminals are to have suitable indelible means of identification to facilitate testing and repair. The identification markings shall be coordinated with identical markings on the wiring diagrams.
5. All leads, except the control and signal circuits, shall be provided with either solder or solderless lugs. Control and signals wires shall be brought to accessible washer type or soldered terminals or studs.
6. Provide solid state reduced voltage starter, NEMA rated for the pump motor.

E. Firefighter Operation

1. Provide Phase I and Phase II firefighter operation in accordance with requirements of Code and local authorities.
2. Directly engrave the firefighter instructions and symbols to the faceplate of the hall call stations and the car operating panels. **(Delete engraving if separate pictographs will be utilized.)**
3. Elevator Contractor is required to tie into their equipment newly installed smoke detectors provided by others.

F. Automatic Re-leveling

1. Equip the elevator with a floor-leveling device which shall automatically bring the car to a stop with its floor height within 1/4" of any floor for which a stop has been initiated, regardless of load or direction of travel. Provide an automatic re-leveling device, which shall be arranged to automatically return the elevator to the floor in the event it should creep down a predetermined distance below the floor level.
 - a. This device shall be operative at all floors served, whether the hoist way doors or car door is open or closed, or whether the emergency stop switch has been thrown, provided there is no interruption of power to the elevator.

G. Protective Device

1. Should a hydraulic elevator stall due to low oil condition, or the elevator fails to reach the landing in the up direction, the protective device shall automatically return the elevator to the bottom landing, open the door and shut down the system

H. Sound Reducing Protection

1. When operating per plans and specifications, the elevator equipment shall not generate noise levels in excess of NC-35 in occupied tenant spaces and shall be free of pure tones. For the purpose of this specification, a pure tone shall be defined as a sound level in any one-third octave band, which is greater than 5 dB above both adjacent one-third octave bands, in the range 45 to 11,200 Hz. Provide the following treatment.
 - a. Mount sound insulating panels, manufactured of reinforced 16 gauge steel panels with a 1" thick 1-1/2 lbs. core of fiberglass affixed to interior, on all four (4) open sides of the power unit frame to isolate airborne noise from belt-driven motor-pump assembly. **[Delete if using submersible power unit in paragraph 2.7B]**
 - b. Install a minimum of two (2) sound isolating couplings in the oil line in the machine room between pump and jack. Each coupling shall consist of two (2)

machined flanges separated by two (2) neoprene seals to absorb vibration and to positively prevent metal-to-metal contact in the oil line. Build couplings in such a manner that they will be absolutely blow-out proof.

- c. Install an oil-hydraulic muffler in oil line near power unit. It shall contain pulsation absorbing material inserted in a blow-out proof housing, arranged for inspecting interior parts without removing unit from oil line. Rubber hose without blow-out proof features will not be acceptable.
- d. Mount vibration pads under the power unit assembly and oil line support brackets to isolate the unit from the building structure.
- e. Locate the power unit at least 1" from any walls.
- f. Provide a resilient insert of neoprene sponge at any hydraulic floor or wall supports or use neoprene mount or hanger for the support.
- g. Use flexible conduit with ground wiring for pump unit connections.

I. Auto Lowering

- 1. Provide an automatic lowering feature for all elevators. In the case of normal power outage, an emergency operation shall be activated, lowering the car to the ground floor. The doors shall open automatically to discharge passengers. The elevator shall remain parked with its doors closed and door open button operative until normal power is restored. The control panel for this operation shall be located in the machine room and shall be fed by a 120 volt, 20-Ampere branch circuit.
 - a. When normal power is restored, the elevator shall return to normal service only after the completion of the automatic lowering operation.
 - b. Provide a test button in the control panel to simulate this operation.
 - c. The control circuit of the emergency unit shall be electrically interlocked with the elevator main disconnect switch so that the emergency power unit is disabled when the elevator main disconnect is in the open position.

2.7 MACHINE ROOM EQUIPMENT

(Note to Specification Writer: Use Option 1 for 4,000 pound and larger elevators. Use option 2 for elevators under 4,000 pounds.)

OPTION 1, Dry Unit

- A. Pump Motor: Provide an alternating current induction motor, maximum speed of 1800 RPM, 120 starts per hour, continuous rated, 50° C temperature rise.
- B. Power Unit
 - 1. Provide a self-contained power unit. It shall include: a structural steel outer base, including rank supports; a 16 gauge oil tight drip pan; a floating inner base so that there is no metallic contact for mounting the motor pump assembly; sound isolation panels to enclose the unit and reduce airborne noises.

2. Provide a reinforced overhead oil reservoir with a tight fitting tank over the oil control unit.
 - a. Included in the reservoir shall be an oil fill strainer with air filter and oil level dip stick assembly, and a self-cleaning strainer in the suction line.
3. Design the pump for oil hydraulic elevator service. It shall be of the positive displacement screw type inherently designed for steady discharge with minimum pulsation and will give smooth quiet operation. The drive shall be by multiple V-Belts and sheaves.
4. All power unit equipment shall be located outside the tank.
5. The oil control unit shall be of the manufacturer's own design but shall include relief, safety check, start and slow down valves. **The valve assembly for the oil control unit shall be manufactured by Maxton Valve Company. No substitutions will be acceptable.**
 - a. Use lowering and leveling valves for drop away speed, lowering speed, leveling speed and stopping speed to insure smooth down starts and stops.
 - b. Provide a valve for manual lowering of the elevator car in event of power failure and for use in servicing and adjusting the elevator mechanism.
 - c. The tank shall have a shut-off valve for isolating oil in the power unit tank to allow servicing and adjusting the elevator without removing oil from the tank.
 - d. All valves shall be accessible for adjustment. Installation shall allow all future adjustments without removing the assembly from the oil line.
6. Provide a thermostatically controlled heater in the oil tank to maintain proper operating oil temperature. **Note to specification writer: This requirement should be deleted unless the hoistway and elevator machine room are in unheated structures such as parking structures.**
7. Provide manufacturer's standard oil cooler, sized and designed to maintain a maximum oil temperature of 100 degrees F. **Note to Specification Writer: This requirement can be deleted if the elevator hoistway and machine room are in an air-conditioned building and the elevator is not heavily used.**

Option 2: Submersible Unit

1. Assembled unit consisting of submersible type positive-displacement pump, induction motor, master-type control valves combining safety features, holding, direction, bypass, stopping and manual-lowering functions, shutoff valve, oil reservoir with protected-vent opening, oil gauge and outlet strainer and connections all mounted on isolating pads. Install new closed transition electronic SCR soft start starter. **The valve assembly for the submersible unit shall be manufactured by Maxton Valve Company. No substitutions will be acceptable.**

- 2 Provide a thermostatically controlled heater in the oil tank to maintain proper operating oil temperature. **Note to specification writer: This requirement can be deleted if the hoistway and elevator machine room are in spaces heated to occupancy temperatures.**
- 3 Provide manufacturer's standard oil cooler, sized and designed to maintain a maximum oil temperature of 100 degrees F. **Note to Specification Writer: This requirement can be deleted if the elevator hoistway and machine room are in an air-conditioned building and the elevator is not heavily used.**

C. Piping and Oil:

1. Provide all necessary pipes and fittings to connect the power unit to the jack. Use minimum Schedule 80 steel pipe. A shut-off valve shall be provided in the machine room, and a blowout-proof muffler shall be installed in the pipe line for substantially quiet operation.

D. Mainline Strainer

1. Provide a mainline strainer of the self-cleaning, compact type, equipped with a 40-mesh element and installed in the oil line. Design the unit for 400 psi working pressure.

2.8 FIXTURES

A. Main Car Operating Panel

- 1 Provide a main car operating panel mounted inside the front return panel of the car.
2. The call buttons provided for each floor served shall cause the car to travel to the floor on momentary pressure of the call button.
3. The call buttons shall become individually illuminated as they are pressed. The button lights shall be extinguished as the calls are answered.
4. The panel shall include the following organized as stated:
 - a. At the top of the COP list the elevator rated load, the elevator number and "No Smoking" engraving.
 - b. Car position indicator
 - c. Emergency lighting fixture (flush mounted)
 - d. A self locking Fireman's Control Panel Cover with the following items in the panel:
 - (1). Three (3) position firefighter key-operated switch, Yale 3502
 - (2). Door open and door close buttons
 - (3). Call Cancel Button
 - (4). Emergency Stop Switch
 - (5). Fire Light

- e. Phase II firefighter's service operating procedures and building name shall be engraved directly on the locking Firemen's Control Panel Cover.
 - f. Show a Fire Light on the face of COP. Do not provide a Firemen's phone plug.
 - g. A locked service cabinet containing the key switches required to operate and maintain the elevator, including, but not limited to:
 - 1). Light switch
 - 2). Independent service key or toggle switch
 - 3). Fan switch
 - 4). Emergency light test button- constant pressure type
 - 5). GFCI 120V receptacle
 - h. A call button for each floor served
 - i. Door Open/Door Close buttons
 - j. Door Hold Open button (Add if service or freight elevator for extended loading time.
 - k. "Alarm" button
 - l. "Emergency Stop" key switch
 - m. At the bottom of the COP install a push-to-call instrument incorporated in the panel. Use Model #SSP 571D-ADA –AA-93 as manufactured by Communication and Engineering Company (CEECO). A template drawing for this unit will be provided to the Contractor. The instrument's faceplate shall be surface mounted to the main car operating panel with four screws tapped into the main car operating panel. (Do not use retainer nuts as an alternative.)
5. The operating panel shall be recessed in the cab wall with hidden heavy-duty scissor hinges and tamperproof screws securing the cover plate to the operating panel box.
- B. Car Position Indicator
- 1. The position of the car in the hoistway shall be indicated by the illumination of the position indicator numeral corresponding to the floor at which the car has stopped or is passing.
 - 2. Provide manufacturer's standard 2" high LED position indicator with direction arrows, integral with the car operating panel.
- E. Car and Hall Call Buttons
- 1. The buttons shall become individually illuminated as they are pressed and extinguished as the calls are answered.
 - 2. The buttons shall be the vandal resistant type with LED call registered lights.
- F. Hall Call Stations

1. Provide a single button at each terminal floor and two buttons at all other floors. Provide faceplate with tamperproof screws. [Include integral LED car position indicator in hall call stations when the elevator services more than three floors.] Hall call stations shall have a finish to match the car's main operating panel.
2. Install a firefighter key switch in the main lobby level station.
 - a. Engrave Phase I firefighter's service operating procedures directly in hall call station faceplate. **(Delete engraving is a separate pictograph will be used.)**

G. Choose either cab lanterns or hall lanterns and delete the other:

Cab Lanterns: (Preferred to reduce installation and maintenance expense)

1. Provide two (2) Adams Survivor Plus lanterns with visual and audible signal mounted in the face of the strike and return post at each side of the car with concealed mountings.
2. Car lanterns shall indicate the direction of car when doors are 3/4 open.
3. The unit shall sound once for the "up" direction and twice for the "down" direction.

Hall Lanterns:

1. Provide one Adams Survivor Plus hall lantern with visual and audible signal mounted on the hallway wall adjacent to the entrance on each floor served by the elevator in accordance with the codes. Centerline of hall lanterns shall be not less than 72 inches above the floor.
2. Hall lantern shall indicate the direction of car when doors are 3/4 open.
3. The unit shall sound once for the "up" direction and twice for the "down" direction.

F. Emergency Lighting Fixture

1. Provide a self-powered emergency light unit in the elevator car, consisting of a light fixture and a power pack unit.
 - a. The light fixture shall contain a minimum of two (2) incandescent lamps.
 - b. The power pack shall contain a nickel cadmium battery and a charger.
 - c. Unit shall provide illumination for at least four (4) hours.
2. The operation shall be completely automatic upon failure of normal power supply. Unit shall be connected to normal power supply for car lights and arranged to be energized at all times. It automatically recharges battery after use.
3. Flush mount the light fixture in the car's main operating panel. It shall have a milk white lens. Mount the power pack to the top of the cab canopy.

G. Fixture Attachment, Finish and Design

1. Graphics shall be selected by the Architect.
2. Refer to drawings for other design requirements. The faceplates shall be 1/8" thick with eased edges. Finish to match metal surfaces specified. The fixtures shall be as selected by the Architect from the manufacturers line of vandal resistant fixtures.
3. The screw and key switch cylinder finishes shall match faceplate finish.

2.9 PERFORMANCE AND DESIGN REQUIREMENTS

A. The elevators shall be adjusted to meet the following performance requirements:

1. Speed: within 5% of rated speed under any loading condition.
2. Leveling: within 1/4" under any loading condition.
3. Door dwell time for hall calls: 5.0 seconds (adjustable)
4. Door dwell time for car calls: 3.0 seconds (adjustable)
5. Door opening time:
 - a. Center-Opening Doors: 1.5 seconds typical for 42" width, adjust to suit for other width.
 - b. Side-Opening Doors: 2.1 seconds typical for 42" width, adjust to suit for other width.
6. Door closing time:
 - a. Center-Opening Doors: 2.4 seconds typical for 42" width, adjust to suit for other width.
 - b. Side-Opening Doors: 4.1 seconds typical for 42" width, adjust to suit for other width.
7. Floor-to-Floor Time (Time from when doors start to close until 1/2 open for center-opening or 3/4 open for side opening based on typical 12'0" floor height).
 - a. Center-Opening Doors: 9.8 seconds typical for 42" width, adjust to suit for other door width or floor-to-floor height.
 - b. Side-Opening Doors: 12.0 seconds typical for 42" width, adjust to suit for other door width or floor-to-floor height.
8. Hydraulic Pressure: 400 psi maximum

2.10 SPECIAL REQUIREMENTS

A. Handicapped Requirements

1. Comply with ADA requirements.
2. Locate door-reopening devices at 5 and 29 inches above the finish floor.
3. Locate the alarm button and emergency stop switch at not less than 35 inches, and floor and control button not more than 54 inches.
4. Provide car buttons with raised markings in the panel. Letters and numbers shall be a minimum of 5/8 inch and raised .03 inch and shall be in contrasting color to the call buttons. The raised markings shall be as selected by the Architect and shall be stud mounted flush with the faceplate.
5. The centerline of the hall pushbutton station shall be 42" above the floor.
6. The cab lantern shall sound once for the "up" direction and twice for the "down" direction and be located at a minimum of 72" above the floor.
7. Provide floor designations at each entrance on both sides of jamb at a height of 60" above the floor. Designations shall be black 2" high, raised .03 inches and shall be as selected by the Architect. Floor designations shall be screwed into the jambs with tamperproof screws.
8. Provide as an integral Component of the car position indicator an audible signal to tell passenger that the car is stopping or passing a floor served by the elevator.

B. Elevator Identification: **(Applicable in any building with more than one new or existing elevators for use by emergency response personnel.)**

1. Identify each elevator by number (PE1, FE2, etc.) on the cross head, on the elevator motor's disconnect switch, the elevator's controls cabinet and at each floor's elevator lobby on the external edge of the hoistway entrance centered above the doors. One and one-half inch high vinyl letters in a Helvetica regular font shall be used. The letters shall be black in color for stainless steel entrances and black, light gray or white on painted entrances as appropriate depending on the color of the entrances. For crossheads, disconnect switches and control cabinets use letters that are white or black if the background is white.

2.11 CAR ENCLOSURE

NOTE TO SPECIFICATION WRITER: Four standard options for car enclosures are listed below. Select one and delete the others. Option 1 has plastic laminate panels on a baked enamel shell. Option 2 is a stainless steel interior. Option 3 is a bronze or antique bronze interior. Option 4 is a service or freight elevator in a patterned stainless steel. In each of the options some

paragraphs list more than one choice in brackets. Select the option desired and delete the others. In option 3, delete all bracketed items concerning an antique finish, if a standard brushed bronze finish is desired.

A. Option 1: Passenger Elevator: Provide complete car enclosure as specified herein. Provide the following features as a minimum:

1. Shell: Reinforced 14-gauge cold rolled steel with manufacturer's standard color baked enamel finish. Shell to have ventilation slots just above car floor. Apply sound-deadening mastic to exterior of the shell.
2. Car Top: Reinforced 12-gauge furniture steel with hinged exit lockable from the car top. Finish with white reflective baked enamel paint.
3. Front Return Panels: Reinforced 14 gauge no. 4 finish stainless steel with cutout for car operating panel, etc.
4. Entrance columns and Transoms: Reinforced 14 gauge no. 4 finish stainless steel.
5. Car Door Panels: Minimum reinforced 16 gauge no. 4 finish stainless steel. Metal cladding shall wrap around the leading edge of the panels and return a minimum of 1" on rear side of panels.
6. Wall Panels: Raised removable color-core plastic laminate panels. Minimum two panels for each side wall and three for rear wall.
7. Reveals, Base & Freize: Plastic laminate on built-up substrate to make raised panels tight to reveals. Arrange for concealed ventilation slots in base. Black plastic laminate or #4 stainless steel strips shall be used for reveals, base and freize.
8. Handrails: 1-1/2" x 3/8" solid stainless steel bars on all walls without car doors. Locate handrails at 32" above the car floor. Bolt handrails through car walls from back and mount 1-1/2" stainless steel standoff spacers no more than 18" on center. Return handrail ends to car walls.
9. Ventilation: Two-speed exhaust blower mounted to car canopy on isolated rubber grommets. Morrison Products, Model OE with a diffuser and grille.
10. Lighting: T-8 fluorescent fixtures surface mounted to the ceiling.

11. Suspended Ceiling: Three-section [stainless steel] [anodized aluminum] drop-frame with milk-white translucent diffusers.
12. Floor: [VCT floor tile] [carpet] will be installed by others. Recess floor the thickness of the [floor tile] [carpet] [**Modify if the elevator contractor is to install the floor surface material and insert a description of the floor tile or carpeting**]
13. Pads: Provide 4-piece removable pads and stainless steel buttons for cab side, rear and front return panel walls. Provide cut-out in pad to access fixtures. Secure pads with removable stainless steel retainer clips.

Option 2: Passenger Elevator. Provide complete car enclosure as specified herein. Provide the following features as a minimum:

1. Shell: Reinforced 14 gauge stainless steel with no. 4 finish. Shell to have ventilation slots just above car floor. Apply sound-deadening mastic to exterior of the shell.
2. Car Top: Reinforced 12-gauge furniture steel with hinged exit lockable from the car top. Finish with white reflective baked enamel paint.
3. Front Return Panels: Reinforced 14 gauge no. 4 finish stainless steel with cutout for car operating panel, etc.
4. Entrance columns and Transoms: Reinforced 14 gauge no. 4 finish stainless steel.
5. Car Door Panels: Minimum reinforced 16 gauge no. 4 finish stainless steel. Metal cladding shall wrap around the leading edge of the panels and return a minimum of 1" on rear side of panels.
6. Handrails: 1-1/2" x 3/8" solid stainless steel bars on all walls without car doors. Locate handrails at 32" above the car floor. Bolt handrails through car walls from back and mount 1-1/2" stainless steel standoff spacers no more than 18" on center. Return handrail ends to car walls.
7. Ventilation: Two-speed exhaust blower mounted to car canopy on isolated rubber grommets. Morrison Products, Model OE with a diffuser and grille.
8. Lighting: T-8 fluorescent fixtures surface mounted to the ceiling.

9. Suspended Ceiling: Three-section [stainless steel] [anodized aluminum] drop-frame with milk-white translucent diffusers.
10. Floor: [VCT floor tile] [carpet] will be installed by others. Recess floor the thickness of the [floor tile] [carpet] [**Modify if the elevator contractor is to install the floor surface material and insert a description of the floor tile or carpeting**]
11. Pads: Provide 4-piece removable pads and stainless steel buttons for cab side, rear and front return panel walls. Provide cutout in pad to access fixtures. Secure pads with removable stainless steel retainer clips.

Option 3: Passenger Elevator. Provide complete car enclosure as specified herein. Provide the following features as a minimum:

1. Shell: Reinforced 14-gauge cold rolled steel with selected baked enamel finish. Shell to have ventilation slots just above car floor. Apply sound-deadening mastic to exterior of the shell. Brushed bronze panels with a no. 4 finish shall be installed on the side and rear walls [with or without built-up reveals.] [The brushed bronze panels shall have an antique finish approved by Princeton University.]
2. Car Top: Reinforced 12-gauge furniture steel with hinged exit lockable from the car top. Finish with white reflective baked enamel paint.
3. Front Return Panels: Reinforced 14 gauge brushed bronze with no. 4 finish with cutout for car operating panel, etc. [Finish the brushed bronze to an antique finish approved by Princeton University.]
4. Entrance columns and Transoms: Reinforced 14 gauge brushed bronze with no. 4 finish. [Finish the brushed bronze to an antique finish to match the car walls.]
5. Car Door Panels: Minimum reinforced 16 gauge brushed bronze with no. 4 finish. [Finish the brushed bronze to an antique finish to match the car walls.] Metal cladding shall wrap around the leading edge of the panels and return a minimum of 1" on rear side of panels.
6. Handrails: 1-1/2" x 3/8" solid bronze bars on all walls without car doors. Locate handrails at 32" above the car floor. Bolt handrails through car walls from back and mount 1-1/2" bronze standoff spacers no more than 18" on

center. Return handrail ends to car walls. [Finish the brushed bronze to an antique finish to match the car walls.]

7. Ventilation: Two-speed exhaust blower mounted to car canopy on isolated rubber grommets. Morrison Products, Model OE with a diffuser and grille.
8. Lighting: T-8 fluorescent fixtures surface mounted to the ceiling.
9. Suspended Ceiling: Three-section brushed bronze drop-frame with milk-white translucent diffusers. [Finish the brushed bronze drop frame to an antique finish to match the car walls.]
10. Floor: [VCT floor tile] [carpet] will be installed by others. Recess floor the thickness of the [floor tile] [carpet] [**Modify if the elevator contractor is to install the floor surface material and insert a description of the floor tile or carpeting**]
11. Pads: Provide 4-piece removable pads and bronze buttons for cab side, rear and front return panel walls. Provide cutout in pad to access fixtures. [Finish the brushed bronze buttons to an antique finish to match the car walls.] Secure pads with removable [antiqued] brushed bronze retainer clips.

Option 4: Service or Freight Elevator. Provide complete car enclosure as specified herein. Provide the following features as a minimum:

NOTE TO THE SPECIFICATION WRITER: Add the diamond plate protection to the shell and choose the checker plate flooring option on freight elevators and on service elevators where this added protections is appropriate for the expected elevator usage.

1. Shell: Reinforced 14 gauge textured stainless steel as manufactured by Rigidized Metals or approved equal. Pattern shall be similar to 5WL as selected. Apply sound-deadening mastic to exterior. [Apply 1/4" thick satin finish aluminum diamond plate, easily removable, 48" high on sides and rear of the car. Cut out slots in diamond plate over ventilation slots to allow air flow into the cab.]
2. Car Top: Reinforced 12-gauge furniture steel with hinged exit lockable from the car top. Finish with white reflective baked enamel paint.

3. Front Return Panels: Reinforced 14 gauge [brushed][textured 5wl pattern] no. 4 finish stainless steel with cutout for car operating panel, etc.
4. Entrance columns and Transoms: Reinforced 14 gauge [brushed][textured 5wl pattern] no. 4 finish stainless steel.
5. Car Door Panels: Minimum reinforced 16 gauge textured 5wl pattern no. 4 finish stainless steel to match shell. Metal cladding shall wrap around the leading edge of the panels and return a minimum of 1" on rear side of panels.
6. Handrails: Two lines applied to all walls without car doors. Top line shall be 1-1/2" x 3/8" solid stainless steel bars mounted 32" above car floor. Bottom line shall be 4" x 3/8" solid stainless steel bars mounted 8" above the car floor. Bolt handrails through car walls from back and mount 1-1/2" stainless steel standoff spacers no more than 18" on center. Return handrail ends to car walls.
7. Ventilation: Two-speed exhaust blower mounted to car canopy on isolated rubber grommets. Morrison Products, Model OE with a diffuser and grille.
8. Lighting: T-8 fluorescent fixtures flush mounted in ceiling with protective diffuser and steel guard over fixture on car top.
9. Floor: [VCT floor tile] [New 1/4" thick satin finish aluminum diamond-plate. Install with counter-sunk screw fasteners. Design in two pieces with seam perpendicular to opening such that each piece can be removed and replaced without dismantling cab.] **[If VCT floor tile is to be installed by others, so state. If by the elevator contractor, insert a specification for the floor tile.]**
10. Pads: Provide 4-piece removable pads and stainless steel buttons for cab side, rear and front return panel walls. Provide cutout in pad to access fixtures. Secure pads with removable stainless steel retainer clips. **[Delete pads if aluminum diamond plate is added to the shell.]**

PART 3 EXECUTION

3.1 INSPECTION

- A. Study the Contract Documents with regard to the work as shown and required so as to insure its completeness.

- B. Examine surface and conditions to which this work is to be attached or applied, and notify the Architect in writing, if conditions or surfaces are detrimental to the proper and expeditious installation of the work. Starting the work shall imply acceptance of the surfaces and conditions to perform the work as specified.
- C. Verify, by measurements at the job site, dimensions affecting the work. Bring field dimensions, which are at variance with those on the accepted shop drawings to the attention of the Architect. Obtain the decision regarding corrective measures before the start of fabrication of items affected.
- D. Cooperate in the coordination and scheduling of the work of this section with the work of other sections so as not to delay job progress.

3.2 INSTALLATION

- A. Install the elevators, using skilled workmen in strict accordance with the final accepted shop drawings and other submittals.
- B. Comply with the code, manufacturer's instructions and recommendations.
- C. Coordinate work with the work of other trades for proper time and sequence to avoid construction delays and to insure right-of-way of system. Use lines and levels to ensure dimensional coordination of the work.
- D. Accurately and rigidly secure supporting elements within the shaftways to the encountered construction within the tolerance established.
- E. Erect guide rails plumb and parallel with a tolerance of 1/8" (plus or minus 1/16").
- F. Install rails so joints do not interfere with brackets.
- G. Set entrance plumb in hoistway and in alignment with guide rails prior to the erection of the front walls.
- H. Arrange door tracks and sheaves so that no metal-to-metal contact exists.
- I. Reinforce hoistway fascias to allow not more than 1/2 inch of deflection.
- J. Pack openings around oil line with fire resistant, sound isolating glass or mineral wool.
- K. Install elevator cab enclosure on platform plumb and align cab entrance with hoistway entrances.
- L. Sound isolate cab enclosure from car structure. Allow no direct rigid connections between enclosure and car structure and between platform and car structure.
- M. Isolate cab fan from canopy to minimize vibration and noise.

- N. Remove oil, dirt and impurities and give a factory coat of rust inhibitive paint to all exposed surfaces of struts, hanger supports, covers, fascias, toe guards, dust covers and other ferrous metal.
 - O. Pre-hang traveling cables for at least 24 hours with ends suitably weighted to eliminate twisting.
 - P. Provide isolation pad between platen head and car structure.
 - Q. Set jack unit and PVC liner plumb in steel casing and bolt the jack unit to the mounting channels in the pit.
 - R. Sound isolate pump units and controllers from building structure.
 - S. Mount operating fixtures with tamperproof screws. Coordinate fixture material and finishes with the Architect.
 - T. Adjust elevators to meet the performance requirements.
 - U. Provide and install motors, switches, controls, safety and maintenance and operating devices in strict accordance with the submitted wiring diagrams and applicable codes and regulations having jurisdiction.
 - V. After installation touch up, in the field, surfaces of shop primed elements, which have become scratched or damaged.
 - W. Lubricate operating parts of system as recommended by the manufacturer.
 - X. Maintain hoistway barriers installed by GC once elevator installation commences.
- 3.3 PROTECTION AND CLEANING
- A. Adequately protect surfaces against accumulation of paint, mortar, mastic and disfiguration or discoloration and damage during shipment and installation.
 - B. Upon completion, remove protection and thoroughly clean work and have it free from discoloration, scratches, dents and other surface defects.
 - C. The finished installation shall be free of defects. Before final completion and acceptance of the building, repair and/or replace defective work, to the satisfaction of the Architect and the Owner at no additional cost.

END OF SECTION